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## A NOTE ON TAXONOMIC CHARACTERS IN LOLIUM

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The introduced grasses, *Lolium perenne* L. and *L. multiflorum* Lam., are listed in many manuals (e.g. Abrams, 1940; Munz, 1959; Hitchcock, 1950) as two distinct species, separated from each other primarily on the basis of whether the lemma is awned or not. However, in southern California, awned and awnless plants frequently grow in mixed stands. A study was begun to determine whether the presence or absence of an awn is sufficient grounds for distinguishing the two species and to investigate the possibility that other criteria might be more valid. A sample of 50 plants was collected from a mixed population, growing alongside U. S. Highway 60 near the campus of the University of California at Riverside and studied to determine whether characters that distinguish the two species were correlated. In addition, seeds were collected from an awnless plant growing in the Riverside locality and from an awned plant and an awnless plant growing at Zumwalt Meadows, Kings Canyon National Park, California. The latter locality was selected because it is climatically and ecologically greatly different from the former locality. The seeds were planted in the greenhouse and the resulting progenies were studied for character correlation.

According to descriptions found in manuals (Fernald, 1950; Hitchcock, 1950; Munz, 1959) *L. multiflorum* is characterized by awned (at least the upper) lemmas 7 to 8 mm. long, 10 to 20 florets per spikelet, and

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an understanding of the family sound: differences in chromosome number and behavior and morphology allow a recognition of trends, and the trends are fundamental, their divergences and convergences constituting a basic revolutionary pattern; taxonomic categories with names and ranks are conveniences and may or may not have real significance."

spikelets twice as long as the glumes, while *L. perenne* is characterized by awnless, or nearly awnless, lemmas 5 to 6 or 7 mm. long, 6 to 10 florets per spikelet, and spikelets little exceeding the glumes. Based on these descriptions, the 50 plants in the Riverside sample would be identified as follows: 33 *L. multiflorum* and 17 *L. perenne* on the basis of awns vs. nearly awnless, if nearly awnless is interpreted to include awns up to 2 mm.; 6 *L. multiflorum*, 6 either species, and 38 *L. perenne* on the basis of floret number; and no *L. multiflorum*, 3 either species, and 47 *L. perenne* on the basis of lemma length.

Actually, the sample from Riverside (fig. 1) indicates continuous variation in both floret number and spikelet glume ratio. These traits are not correlated with awn length and three-fourths of the plants are not consistently one species or the other. The Riverside sample thus appears to represent one segregating population.

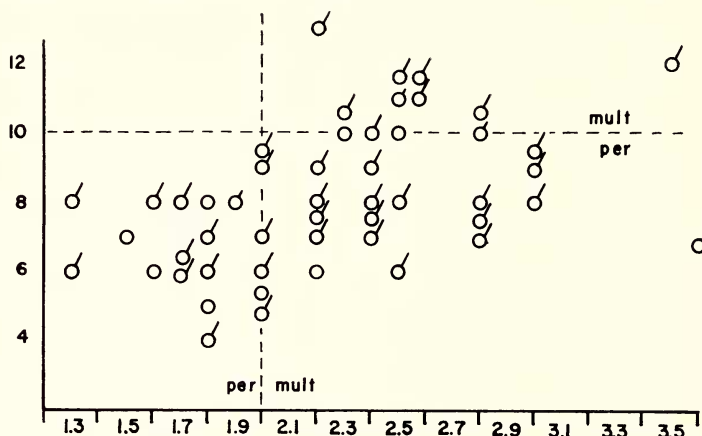


FIG. 1. Scatter diagram of a wild sample from Riverside showing the relationship between the number of florets per spikelet (vertical axis) and the ratio of spikelet length/glume length (horizontal axis). Long diagonal lines indicate awns 1.5–7 mm. long, short diagonal lines indicate awns 0.5–1 mm. long.

A progeny of 15 plants, grown in the greenhouse and derived from one one pollinated awnless plant growing in the Riverside population, shows a similar lack of correlation between awn length and the floret number and spikelet/glume ratio (fig. 2). Furthermore, these plants, all from the same female parent, segregated for the awn-awnless character. Seven plants had an awn 2–6 mm. long, two plants had an awn 1 mm. long, and six plants had no awn.

The two progenies from the Kings Canyon (fig. 3) also show a lack of correlation between awn length, floret number and the spikelet/glume ratio. The distribution of plants on the scatter diagram indicate, too, that the two progenies represent but one population. Furthermore, both progenies segregated for the awn-awnless character as follows:

PARENT	OFFSPRING		
	Awnless	Awn 0.5-1.5 mm.	Awn 2.0-6.0 mm.
Awnless	2	11	8
Awned	4	7	20

Unpublished data of the authors further indicate that awn length, floret number and spikelet/glume ratio are not correlated with spike length, spikelet length, number of spikelets per spike, number of spikes per plant and flowering response to cold treatment, long photoperiod and normal day length.

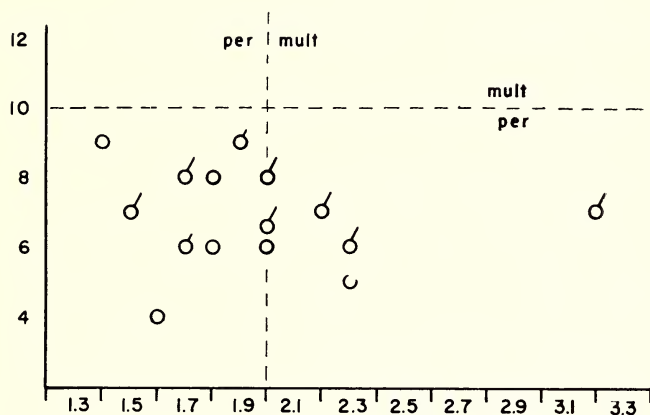


FIG. 2. Scatter diagram of the progeny of an open pollinated, awnless seed parent from Riverside (coordinates as in fig. 1).

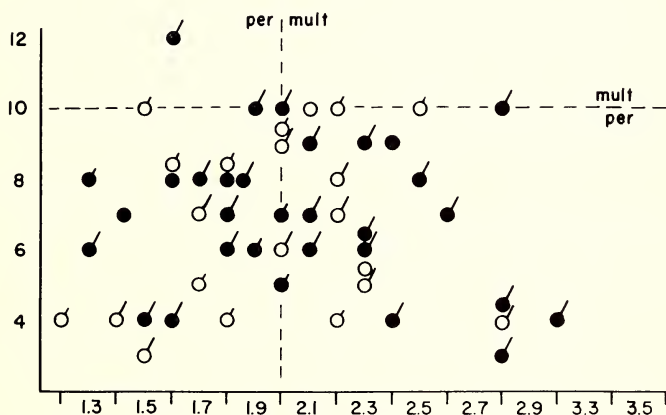


FIG. 3. Scatter diagram of the progeny of an awnless seed parent (open circles) and an awned seed parent (solid circles) from Kings Canyon National Park (coordinates as in fig. 1).

Although our samples are few, our data clearly indicate that segregation for awned vs. awnless may occur in the progeny of a single plant, regardless of whether that plant was awned or awnless. Furthermore, the progenies of individual plants exhibit continuous variation in floret number and spikelet/glume ratio. Thus, these characters do not distinguish two species. Nor could we find any other basis for distinguishing two species.

Separation of two species on the basis of the traditional taxonomic characters thus appears to be arbitrary and our studies suggest only one species is involved. A similar situation may have confronted Jenkin (1931) who concluded, after considerable experience breeding various grasses, that there was no evidence of incompatibility or of sterility in  $F_1$  of *L. perenne* and (at that time) *L. perenne* var. *multiflorum*. Jenkin's results were not different from those obtainable in intraspecific crosses. This suggests that *L. perenne* and *L. multiflorum* are, in reality, the same species.

However, we have not tested the 'key' characters used by Fernald (1950), namely whether the unexpanded leaves are folded or inrolled, whether the glumes exceed or do not exceed the contiguous floret, and whether the rachis is smooth or roughened. Presumably Jenkin did not use these characters either. Therefore, a possibility exists that our material, and perhaps that studied by Jenkin, may have been all *L. perenne* or all *L. multiflorum*. If so, the problem of identification remains acute in view of the inadequacy of descriptions currently found in west American manuals. Should the 'key' characters used by Fernald prove to be capable of distinguishing two valid taxa, the problem of inadequate description is no less acute for these 'key' characters appear to be merely added to the conventional, inadequate descriptions.

In conclusion, the treatment of *Lolium perenne* and *L. multiflorum*, as currently found in many manuals, is unsatisfactory. A thorough test of the characters used by Fernald, followed by revision of the species descriptions, is in order and thorough population analyses may reveal the existence of only one species.

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